MORE ABERRATIONS OF *COLIAS ELECTO ELECTO* L. (LEP.: PIERIDAE) FROM THE CAPE, SOUTH AFRICA

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Abstract

Three new aberrations of the African Clouded Yellow, *Colias electo electo* L. are described from the South-Western Cape Province of South Africa. Ab. *inconstantis* ab. nov., ab. *pallidula* ab. nov. and ab. *memorabilis* ab. nov. all involve scale deformation and/or pigment deficiency. Speciation of butterflies in The Cape is briefly discussed.

Introduction

During the ten year investigation of *Colias electo electo* L. ab. *capensis* in the foothills of the Riviersonderend Mountains of the South-Western Cape (McLeod & MaeLeod, 2002) several other aberrations were found in the population. Some of these were single individuals and ean be considered as extremely rare, while others were more numerous with several examples being obtained during a single day. Numbers were, however, so low as to make it likely that eaeh aberration was the offspring of a single female.

Descriptions of the new aberrations

Colias electo electo L. ab. *inconstantis* ab.nov. (Plate F, Figs. 1 – 4)

Holotype ♂ Riviersonderend, Cape, South Africa, 10. xi. 1998, L. MeLeod

Allotype ♀ Riviersonderend, Cape, South Africa, 15.xi.1998, L. McLeod

Paratypes 5♀♀ from the type loeality, 16. xi. 1998, L. MeLeod

All speeimens are in the eolleetion of L. MeLeod. The phenotype is eharaeterised by the presenee of patches of transparent scales, totally laeking in pigment, randomly distributed and variable in size, thus eausing eaeh individual to be unique. This charaeter is partieularly evident on the undersides of both fore and hind wings. To the naked eye these patehes appear to be grey in eolour, resulting from the wing membrane showing through the transparent seales. The upper sides of both fore and hind wings exhibit normal patterns but the colours are less brilliant and somewhat faded, even in fresh speeimens. Unlike ab. *capensis*, the scale shape and orientation is normal and the fringes are pink in those areas of the wings that remain pigmented. In extreme examples, the undersides tend to be devoid of markings or with markings greatly redueed. Occasionally the underside ground colour appears to be almost entirely white. Sometimes the extremities of the wings tend to be bleaehed.

***Colias electo electo* L. ab. *pallidula* ab. nov.**

Holotype ♀ Riviersonderend, Cape, South Africa, 20.x.1993, L. McLeod

Paratypes 6 ♂♂ from the type locality, 20.x.1993, L. McLeod.

All specimens are in the collection of L. McLeod. In the field, the initial impression is that these are worn individuals, but on examination this assumption is seen to be incorrect. This aberration is characterised by an overall reduction in pigmentation resulting in a phenotype which has "normal" markings and colours, but which is pale and relatively dull and drab. Scale shape and orientation are normal but transparent scales totally lacking pigment granules, and scales with fewer pigment granules, are scattered over both upper sides and undersides of all wing surfaces.

In males, the UV flash is reduced thus making it unlikely that ab. *pallidula* males will be accepted by a female during courtship.

***Colias electo electo* L. ab. *memorabilis* ab. nov. (Plate F, Figs. 5 & 6)**

Holotype ♀ Riviersonderend, Cape, South Africa, 21.xi.1987, L. McLeod.

The single female specimen of this unusual phenotype, which is in the collection of L. McLeod, was one of the first aberrations of this species taken by the author in the foothills of the Riviersonderend Mountains in 1987 and is mentioned in McLeod & MacLeod (2002). A second example of this aberration was observed at close range by the writer on 27 October 2003 at the same location, but unfortunately was not captured. The first noticeable difference is its small size, which is probably a distinguishing character. The measurement from wing tip to wingtip is only 30mm. At the time of capture of the first individual there were no other examples of butterflies of this size, likewise at the time of observing the second individual. This suggests that its size is genetically controlled, unlike most examples of ab. *minor* which result from food shortages in late larval life.

The main characters which distinguish this aberration from the typical form are a total lack of yellow and red pigmentation in the non-melanin-containing scales, accompanied by extreme deformation/malorientation of scales of both upper side and underside wing surfaces. This indicates a possible close relationship to ab. *capensis*. However, this aberration is far more extreme and the longitudinal rolling deformities of the scales are extensive, giving the dorsal forewing (DFW) a furry appearance. The melanin-containing scales are normal, thus the discoidal spot and marginal borders of the DFW are black. The spots enclosed by the DFW borders, and the non-melanin-containing scales of both DFW and dorsal hindwing (DHW) are white. The DHW is heavily dusted with black scales thus giving the ground colour a grey appearance, as in a typical f. *aurivilliusi* (Plate F, Figs. 7 & 8). The yellow ground colour of the ventral forewing (VFW) of the typical form is here replaced by transparent scales, which results in a "mother-of-pearl" effect when viewed from a certain angle. To the

naked eye the ventral hindwing (VHW) ground colour and the VFW apex and border appear silvery blue-grey because of the wing membrane showing through the transparent scales. Pigment granules are totally lacking in these scales (cf. *Colias croceus* ab. *russwormi* Harmer, 1999). The costal spot and marginal spots are pale and indistinct while the pupils of the post discal spots of the VHW are silvery white. Fringes are also transparent.

The whiteness of the upper side ground colour does suggest that this phenotype might be an aberration of the white female f. *aurivilliusi*. It is certainly vastly different to f. *aurivilliusi* ab. *capensis*, which retains yellow pigmentation and which is illustrated in McLeod & MacLeod (2002).

Discussion

It would appear that in the South-Western Cape, the current surge of genetic changes in *C. electo* mainly affects the scale formation of the wings, including not only their malorientation and distortion, but also their pigmentation. Ab. *capensis* and the three aberrations here described are all concerned with these characters. Obviously any changes which affect the phenotype in this way will readily be seen by lepidopterists, by the butterflies themselves and perhaps by their predators. The possible effect of such changes on butterfly courtship has already been discussed in a previous paper. Scale deformation accompanied by pigment changes have also been recorded in other butterfly families (Birkett, 1976, 1978) and it may be that these characters are amongst the first to be damaged from any increases in radiation. On the other hand it may be that these changes, because they are non-lethal, allow such individuals to survive. As in all animal populations, there will undoubtedly be other changes which remain hidden, or which are lethal.

Notes on the Speciation of Butterflies in the Cape

In the South-Western Cape of South Africa butterflies are not common because most of the vegetation is sclerophyllous and its low nitrogen content is unsuitable for phytophagous larvae. Suitable larval foodplants for butterflies are relatively scarce. Despite this, the region is unusual for the high level of speciation that has taken place there, not only in the fauna but also in the flora, the ecologies of both being inter-related. Sub-speciation and eventual speciation must be preceded by segregation of populations and consequent interruption of gene flow. In the Cape Province each mountain range has a distinct climate and a distinct flora and it is these contemporary conditions of dissected landscape, soil diversity and moisture gradients which aid in the reproductive isolation of butterfly species and also appear to be conducive to speciation and endemics. Fluctuations of other inhibiting factors such as diseases, predators and parasites, scarcity of foodplants etc. may from time to time, reduce the population of a species by contracting its range to favourable areas. In this way several populations will arise which may remain isolated from each other long enough

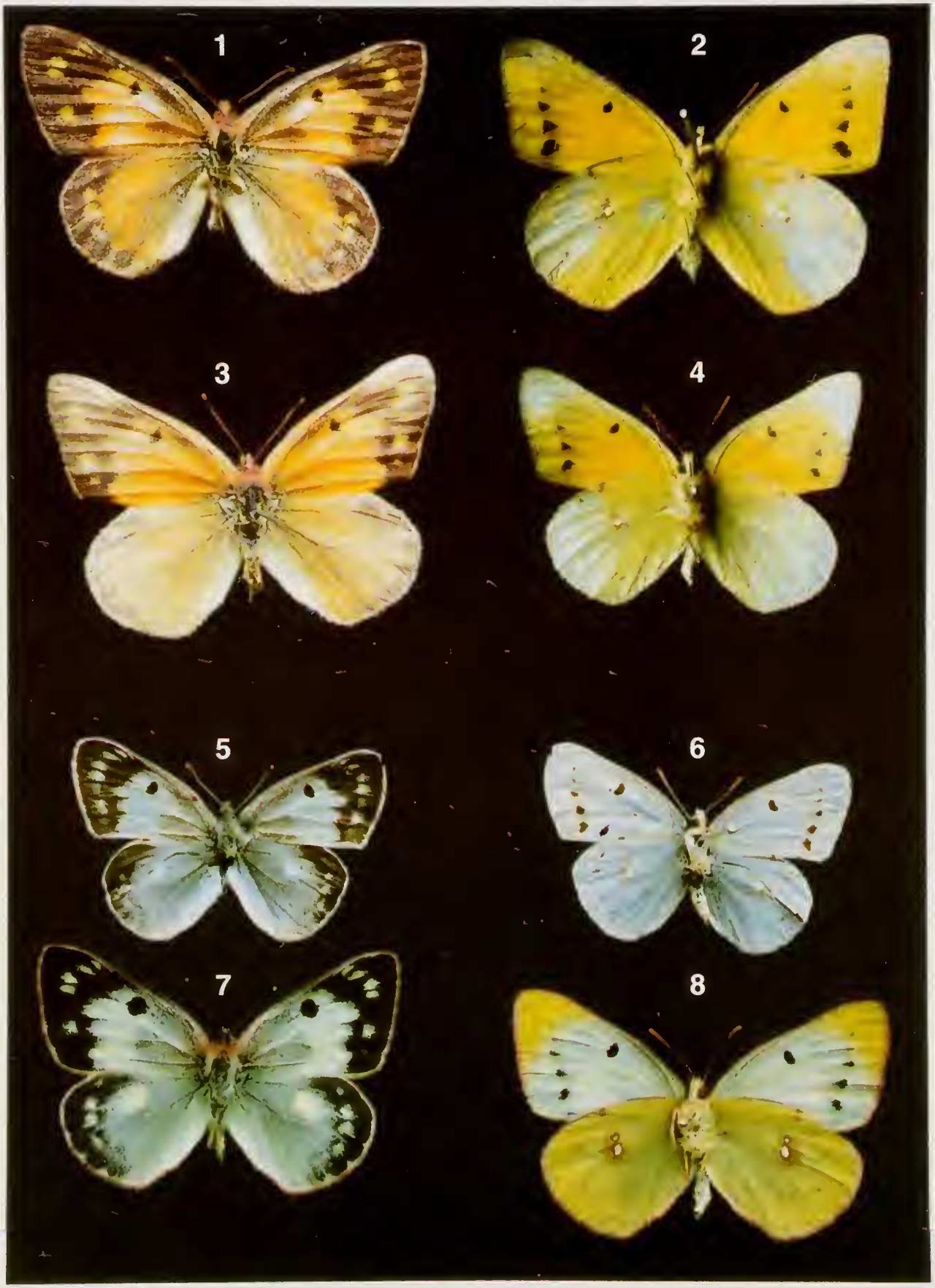

Plate F. Aberrations and forms of *Colias electo electo* L. Figs. 1 & 3. ab. *inconstantis* ab.nov. ♀ Uppersides; Figs. 2 & 4. ab.*inconstantis* ab.nov. ♀ Undersides; Fig. 5. ab. *memorabilis* ab.nov. ♀ Upperside; Fig. 6. ab *memorabilis* ab.nov. ♀ Underside; Fig. 7. f. *aurivilliusi* Upperside; Fig. 8. f. *aurivilliusi* Underside.

for sub-speciation or speciation to take place. Frequently several closely related species can be found within relatively small areas. The remarkable levels to which the situation has evolved in the Cape can best be seen in the Lycaenidae. Almost every mountain range, of which there are many, has produced its own species or subspecies. (Some authorities in South Africa are of the opinion that in past years there has been an over-enthusiasm for describing new subspecies. It is now considered that many of the so-called subspecies previously described are merely based upon characters which are not genetically constant.) Fires may have aided in the process of speciation by creating barriers of "inhospitable" land between the mountain ranges and even by the elimination of intermediates. Fires are such a common event, although irregular in occurrence, that certain plant groups have evolved to require the presence of smoke and/or burning of the seed coat to stimulate seed germination. Fires have thus become an integral and important part of the ecology of the region (Pringle 1994) and are essential for the continuation of the *fynbos* flora. The recent very high levels of UV-B radiation, which result from South Africa's close proximity to holes in the ozone layer, might also be responsible for chromosome/DNA damage in insects and resulting genetic aberrations. Studies of the genetic aberrations and range of variation within a species population may help us comprehend more fully the processes of speciation and evolution within the genus.

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Red-headed Chestnut *Conistra erythrocephala* (D.& S.) (Lep. Noctuidae): The first Devon specimen since 1906

A male Red-headed Chestnut was taken at light by Andy Trout at Shaugh Prior, Dartmoor on 12 February 2004. The identification was confirmed by myself and the specimen has been retained in my collection.

Parfitt (1878. *The Fauna of Devon Lepidoptera*, Vol. 10. Devonshire Association) says that one example was taken at sugar on 5 November 1856 at Ivybridge, and that this was the second specimen taken in England. Barrett (1906. *Victoria County History of Devon*) repeats this record, and adds "Honiton" with no date. Stidston (1952. *A List of the Lepidoptera of Devon*, Part 1 and introduction) repeats the claim that the 1856 record was the second in England and adds that the captor of this specimen was J. J. Reading.— Roy McCormick, 36 Paradise Road, Teignmouth, Devon TQ14 8NR.